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Examining Alcohol Consumption, Psychological Distress, and Current Smoking Status: Results from the Behavioral Risk Factor Surveillance System, 2013

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Abstract

Introduction: Approximately 443,000 people die from smoking or exposure to secondhand smoke, and another 8.6 million people have a serious smoking-related illness, which costs nearly $96 billion in health-care expenditures and $97 billion in productivity losses annually in the United States. This study examined the association between alcohol consumption and smoking status, and how psychological distress can affect this association. **Methods:** Data come from the 2013 Behavioral Risk Factor Surveillance System (BRFSS). We used binary logistic regression models to compute adjusted odds ratios between alcohol consumption and smoking status, controlling for age, gender, race, education, and income. We used chi-square model to test whether psychological distress affects the association between alcohol consumption and smoking status. **Results**: In comparison with non-drinkers, light drinkers were 1.26 times more likely to be everyday smokers (adjusted OR=1.26; 95%CI=1.23, 1.29), 1.59 times more likely to be someday smokers (adjusted OR=1.59; 95%CI=1.59, 1.65) and 1.49 times more likely to be former smokers (adjusted OR=1.49; 95%CI=1.47, 1.51). In comparison with non-drinkers, heavy drinkers were 3.03 times more likely to be everyday smokers (adjusted OR=3.03; 95%CI=2.94, 3.12), 3.10 times more likely to be someday smokers (adjusted OR=3.10; 95%CI=2.96, 3.24) and 2.44 times more likely to be former smokers (adjusted OR=2.44; 95%CI=2.38, 2.50). **Discussion:** We found that those who were light drinkers or heavy drinkers were more likely to be former smokers, someday smokers and everyday smokers than non-drinkers, even after controlling for possible con-founders. There was a surprising result that psychological distress did not significantly affect the relation between alcohol consumption and smoking status.

KEYWORDS: Alcohol consumption, smoking status, psychological distress, someday smoke.

Introduction

Tobacco use causes heart disease, pulmonary disease, multiple types of cancer, adverse reproductive effects and the exacerbation of chronic health conditions, although it is the single most preventable cause of disease and death in the United States.[1] Approximately 443,000 people die from smoking or exposure to secondhand smoke, and another 8.6 million people have a serious smoking-related illness, which costs nearly $96 billion in health-care expenditures and $97 billion in productivity losses annually in the United States.[2] Although rates of smoking have declined over the past several decades, approximately one in five Americans continue smoking cigarettes.[1]

Overwhelming evidence suggests that alcohol consumption has a significant association with smoking status. For example, Blomqvist et al., found that exposure to nicotine enhanced alcohol consumption in rats.[3] Mitchell et al., concluded that alcohol consumption versus a placebo beverage acutely increased smoking behavior.[4] Maletzky and Klotter found that there was a high positive correlation between alcohol consumption and tobacco use.[5] Mckee et al., also had a similar result for college students that three quarters of all smoking episodes occurred while under the influence of alcohol.[6] Piasecki et al., reported that alcohol use was associated with a greater urge to smoke.[7]

In addition, Cooper et al., also found that people who reported drinking approximately once a week were more likely to be “someday smokers” than “non-drinkers”.[8] “Someday smokers” has become a very common pattern for people

of any age. Many of these people do not feel addicted to tobacco and do not even call themselves “Smokers”. However, these people were still at high risk of adverse health outcomes.

When smoking is combined with alcohol drinking, there is the potential for worsening health risks and health outcomes for chronic diseases such as cancer. Romberger and Grant concluded that combined exposure to smoking and drinking causes high risk for some diseases such as head and neck cancers.[9] Lieberman et al., reported that exposure to regular alcohol consumption and tobacco smoking was likely to develop adenomas and cancers.[10] Shankar et al., demonstrated that joint exposure to both current smoking and heavy drinking was associated with chronic kidney disease.[11]

Several studies have shown that psychological distress can separately affect alcohol consumption and smoking status. For example, Cooper et al,. concluded that alcohol consumption was used to cope with tension and negative affect[12], which proposed that psychological distress might be one of the psychological responses to alcohol consumption. Ashby and Elizabeth found that alcohol consumption regulated emotional distress by reducing both tension and negative effect.[13] Holahan et al., also found that there was a significant relationship between depressive symptoms and alcohol consumption.[14] Other studies have focused on smoking as a factor in individual’s coping with poor mental health. For example, Pumell et al., found that smoking as self-medication is one way to alleviate stress and associated psychological distress.[15] Kalman et al., also reported that smoking was related to certain forms of

psychological distress, which might result in many smoking cessation failures.[16] Lasser et al., found that persons with mental illness were much more likely to smoke than other persons.[17]

Much of the research has documented that psychological distress can have a association with alcohol consumption or smoking status, but little work has been done to test whether the relationship of alcohol consumption and tobacco use is affected by psychological distress. Currie et al., suggested that individuals who had a combined history of alcoholism and major depression were more likely to smoke.[18]

On the basis of findings from previous studies, we hypothesized that the odds of smoking would be higher among those who drank alcohol than those who did not drink in the past 30 days (hypothesis 1). We also hypothesized that "someday smokers" will be more likely to be "light drinkers" or "heavy drinkers", compared to "everyday smokers" (hypothesis 2). In addition, we hypothesized that psychological distress would affect the association between alcohol consumption and smoking status (hypothesis 3).

METHODS

We used 2013 data from the Behavioral Risk Factor Surveillance System(BRFSS) to examine the association between alcohol consumption and smoking status, and whether psychological distress affects this association. The 2013 BRFSS, which is built from landline and cell phone data submitted for 2013, includes data for 50 states, the District of Columbia, Guam, and Puerto Rico. The 2013 data was the most recent data available at the time of the study. We deleted the missing data and the

respondents who answered “Don’t know/Not sure” and “Refused” in the Tobacco Use section, Alcohol Consumption section and Healthy Days section. According to this rule, a total of 491,773 respondents were administered the BRFSS survey in the states, and 458,202 of these individuals (93.2%) were included in this study. The median survey response rate in 2013 BRFSS was 46.4%, ranged from 29.0% to 60.3%.[19]

Measures

Alcohol consumption. Alcohol consumption was assessed with the following questions: “One drink is equivalent to a 12-ounce beer, a 5-ounce glass of wine, or a drink with one shot of liquor. During the past 30 days, on the days when you drank, about how many drinks did you drink on the average?” and “During the past 30 days, how many days per week or per month did you have at least one drink of any alcoholic beverage such as beer, wine, a malt beverage or liquor?” Alcohol consumption was assessed as total number of alcoholic beverages consumed during the past 30 days, which come from the combination of the answer of these two questions. According to the Dietary Guidelines for Americans 2010, moderate alcohol consumption is 1 drink per day for women and 2 drinks per day for men.[20] Respondents whose alcohol consumption was 0 were coded as non-drinkers. Respondents whose alcohol consumption ranged from 1 to 29 were coded as light drinkers. Respondents whose alcohol consumption was 30 or more were coded as heavy drinkers.

Psychological distress. Psychological distress was assessed with the question: “Now thinking about your mental health, which includes stress, depression, and

problems with emotions, for how many days during the past 30 days was your mental health not good?" Potential scores on the question ranged from 0 to 30. Adult survey respondents had an average of 5.3 unhealthy days a month.[21] Respondents whose poor mental health days were less than six were coded as good mental health. Respondents whose poor mental health days were six or more were coded as poor mental health.

Smoking status. Smoking status was assessed with the following questions: "Have you smoked at least 100 cigarettes in your entire life?"and "Do you now smoke a cigarette every day, some days, or not at all?" Respondents who had smoked at least 100 cigarettes and still smoke every day were coded as everyday smokers. Respondents who had smoked at least 100 cigarettes and just smoke some days were coded as someday smokers. Respondents who had smoked at least 100 cigarettes and did not smoke at all were coded as former smokers. Respondents who had not smoked at least 100 cigarettes were coded as non-smokers.

Potential con-founders. Potential con-founders in association between alcohol consumption and smoking status included age, gender, race, education and income. Age in years was categorized into 6 groups: 18 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, and 65 or older. Race was categorized into 5 groups: non-Hispanic White, non-Hispanic Black, non-Hispanic other race, non-Hispanic multiracial and Hispanic. Education categories included not graduated high school, graduated high school, attended college or technical school and graduated from college or technical school. Income was categorized into 5 groups: less than $15000, $15000 to $25000, $25000 to $35000, $35000 to $50000, and $50000 or more.

Statistical Analysis

We summarized demographic and behavior characteristics by using frequencies and percentages. We used binary logistic regression models to compute adjusted odds ratios between alcohol consumption and smoking status, controlling for age, gender, race, education, and income. We compared everyday smokers, someday smokers, and former smokers to non-smokers (hypothesis 1). We also compared everyday smokers to someday smokers (hypothesis 2). Finally, we used chi-square model to test whether psychological distress affects the association between alcohol consumption and smoking status (hypothesis 3). The statistical significance level was set at $P<0.01$. All analyses were performed by using SPSS version 22.0.

RESULTS

Table 1 provides a demographic and behavior description of the study sample. Almost one third (32.5%) of participants were aged 65 year or older. More than half (59.2%) of participants were female. More than three quarters (77.2%) of participants were non-Hispanic White. About two thirds (62.7%) of participants attended or graduated from college or technical school. About one third (37.9%) of participants had 50,000 or higher income. Smoking status included everyday smokers (11.4%), someday smokers (4.4%), former smokers (29.0%) and non-smokers (55.2%). Less than one fifth (15.8%) of participants were everyday or someday smokers. Almost half (49.7%) of participants were light drinkers (37.4%) or heavy drinkers (12.3%). Less than one fifth (15.2%) participants had poor mental health.

Table 2 presents data on other variables by smoking status and chi-square results

of their association. About half (46.1%) of former smokers were 65 years and older. Almost two thirds (64.1%) of non-smokers were female. About half (41.6%) of non-smokers graduated from college or technical school. About half (41.6%) of non-smokers had $50,000 or higher income. A higher percentage (53.8%) of non-smokers are more likely to be non-drinker. About one quarter (28.3% and 26.1%) of everyday smokers and someday smokers had poor mental health. All the p value of the associations between all the variables and smoking status were less than 0.01.

Table 3 presents results from binary regression models testing the association of alcohol consumption with smoking status. The odds of being everyday smokers, someday smokers, and former smokers were higher among individuals who were light drinkers and heavy drinkers. In comparison with non-drinkers, light drinkers were 1.26 times more likely to be everyday smokers (adjusted OR=1.26; 95%CI=1.23, 1.29), 1.59 times more likely to be someday smokers (adjusted OR=1.59; 95%CI=1.59, 1.65) and 1.49 times more likely to be former smokers (adjusted OR=1.49; 95%CI=1.47, 1.51). In comparison with non-drinkers, heavy drinkers were 3.03 times more likely to be everyday smokers (adjusted OR=3.03; 95%CI=2.94, 3.12), 3.10 times more likely to be someday smokers (adjusted OR=3.10; 95%CI=2.96, 3.24) and 2.44 times more likely to be former smokers (adjusted OR=2.44; 95%CI=2.38, 2.50). Heavy drinkers were not significantly associated with smoking status (everyday smokers and someday smokers) after adjustment for relevant covariates. However, light drinkers were 0.81 times less likely to be everyday smokers (adjusted OR=0.81; 95%CI=0.78, 0.85).

Table 4 presents results from the chi-square test of alcohol consumption and smoking status, by psychological distress. Light drinkers and heavy drinkers of both good mental health and poor mental health had similar smoking status. Someday smokers who had poor mental health were 10.1% more of them to be non-drinkers than those who had good mental health. Moreover, former smokers who had poor mental health were 11.7% more of them to be non-drinkers than those who had good mental health.

DISCUSSION

We found that participants were more likely to be older, female and non-Hispanic White, and had higher income and educational attainment. They also had lower smoking rates and good mental health but higher alcohol consumption.

Consistent with the hypothesis 1, we found that those who were light drinkers or heavy drinkers were more likely to be former smokers, someday smokers and everyday smokers than non-drinkers, even after controlling for possible con-founders. The positive relationship between alcohol consumption and smoking status was consistent with previous studies.[5-8] The concurrent use of alcohol and tobacco was likely to be a reinforcing and pleasurable experience for college students.[7] Also, smokers were more likely to report that cigarettes were good tasting when consuming alcohol with them.[8] In addition, previous research has studied the effect of alcohol consumption on smoking cessation. Toll et al., reported that alcohol intervention in addition to standard smoking cessation treatment could improve quit rates since heavy drinking appeared to reduce smoking cessation success.[22] Foster et al., indicated that it

might be useful to assess for drinking motives among smokers who are problem drinkers in efforts to quit smoking.[23]

We also found that light drinkers were more likely to be someday smokers, compared to everyday smokers. Although someday smoker might not smoke the same number of cigarettes per day to be classified in the data as smokers, the risks of someday smokers are not well understood and may put this category of smokers unknowingly at risks of cancer and other chronic disease. Rubinstein et al., reported that many smoking cessation programs utilized a paradigm of daily smoking when addressing withdrawal symptoms and cravings, which might not be used for someday smokers.[24] Shiffman et al., also concluded that someday smokers were more likely to cite alcohol drinking, socializing, and being with other smokers as common contexts for smoking, to achieve stimulation.[25] Someday smokers who are likely to combine exposure to smoking and drinking may be at higher risks in many diseases.[9-11]

There was a surprising result that psychological distress did not significantly affect the relation between alcohol consumption and smoking status. This result was contrary to previous research. Individuals who were alcoholics and had major depression were more likely to use smoking to enhance mood.[18] A possible explanation was that smoking and drinking tended to co-occur because of other factors rather than psychological distress. For example, good taste and pleasurable experience were the important reasons for the concurrent use of alcohol and tobacco for college students.[7-8] In addition, it is likely that the social interactions of this largely college-educated sample buffer potential psychological distress, which in turn

enhances their mood and sense of well-being. Therefore, they may not handle their psychological distress by drinking or smoking. Finally, contrary to previous studies, we found that someday smokers and former smokers who had poor mental health had a higher percentage of non-drinkers than those who had good mental health. A possible explanation was that people with poor mental health might keep taking medications where alcohol is contraindicated. Graham and Massak found that antidepressants may reduce desire for alcohol for men.[26]

Limitations

One limitation is that 2013 BRFSS response rate was less than half. Due to low response rate, there were potential bias in our research result.

Another limitation in our study was to use stratified chi-square method to analyze how psychological distress can affect the association. We got a broad result by comparing the data of stratified group directly. Additional studies are needed to confirm our findings.

Our study was also limited by the restricted availability of measures of psychological distress within the BRFSS. Psychological distress was measured by participants' self report of their mental health status, which may have recall bias. Therefore, our results may underestimate the association between alcohol consumption, smoking status and psychological distress.

Conclusions

Despite this study's limitations, it used a large sample to report associations between alcohol consumption and smoking status. Our findings also suggest that

when people call Tobacco Quitlines they may need to have a trained counselor who understands the role of drinking and smoking so that a person can get help for their drinking and smoking behaviors simultaneously. Alcohol control can be widely used in smoking cessation to improve quit rates.

We should also pay more attention to someday smoker in the smoking cessation programs. Someday smokers are more likely to exposure to drinking and smoking with underestimating health risks. Future tobacco control efforts need to include the possibility that not all smokers identify themselves according to the traditional categories of smoking.

In future study, we should test the specific differences between someday smokers and everyday smokers, such as their behavior and mental health status. Moreover, we should further study other factors that can affect the association between alcohol consumption and smoking status.

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Biographical Sketch

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Guangxing Zhan earned his Bachelor of Science degree from South China University of Technology in China. In 2013 he joined the master program in College of Public Health at University of Kentucky at Lexington, Kentucky.

Mr. Zhan interned at Shenzhen CDC in 2014 for two months. He investigated the epidemiology of hand-foot-mouth disease in the community. He also analyzed the causes of death in the city by using SPSS software.

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TABLES

TABLE1-Demographic and Behavior Characteristics: BRFSS, 2013

	No. (%)
Age	
18-24	25092(5.5)
25-34	46711(10.2)
35-44	56490(12.3)
45-54	78595(17.2)
55-64	102269(22.3)
≥65	149045(32.5)
Gender	
Male	186746(40.8)
Female	271456(59.2)
Race*	
Non-Hispanic White	353793(77.2)
Non-Hispanic Black	35521(7.8)
Non-Hispanic other race	19511(4.3)
Non-Hispanic multiracial	8557(1.9)
Hispanic	33699(7.4)
Education*	
Not graduated high school	37670(8.2)
Graduated from high school	132048(28.8)
Attended college or Technical school	126071(27.5)
Graduated from college or Technical school	161401(35.2)
Income*	
<$15,000	47959(10.5)
$15,000 to $24,999	71465(15.6)
$25,000 to $34,999	45940(10.0)
$35,000 to $49,999	58415(12.7)
≥$50,000	173749(37.9)
Smoking Status	
Non-smoker	252727 (55.2)
Former smoker	132677 (29.0)
Someday smoker	20341 (4.4)
Everyday smoker	52457 (11.4)
Alcohol consumption	
Non-drinker	230287(50.3)
Light drinker	171500(37.4)
Heavy drinker	56415(12.3)
Psychological distress	
Good mental health	388729(84.8)
Poor mental health	69473(15.2)

Note: * - Variables missing data due to refusal and “don’t know” responses

TABLE 2-Demographic and Behavior Characteristics, by Smoking Status: BRFSS, 2013

	Everyday smoker, No.(%)	Someday smoker, No.(%)	Former smoker, No.(%)	Non-smoker, No.(%)	X^2 statistic	p value
Age					27806.76	<0.01
18-24	3126 (6.0)	1698 (8.3)	1899 (1.4)	18369 (7.3)		
25-34	7356 (14.0)	3299 (16.2)	8104 (6.1)	27952 (11.1)		
35-44	7646 (14.6)	2989 (14.7)	11202 (8.4)	34653 (13.7)		
45-54	12220 (23.3)	4150 (20.4)	18079 (13.6)	44146 (17.5)		
55-64	12801 (24.4)	4617 (22.7)	32275 (24.3)	52576 (20.8)		
≥65	9309 (17.7)	3588 (17.6)	61118 (46.1)	75031 (29.7)		
Gender					5704.94	<0.01
Male	23714 (45.2)	9054 (44.5)	63311 (47.7)	90668 (35.9)		
Female	28744 (54.8)	11287 (55.5)	69366 (52.3)	162059 (64.1)		
Race*					6146.37	<0.01
Non-Hispanic White	40926 (78.0)	13846 (68.1)	110291 (83.1)	188731 (74.7)		
Non-Hispanic Black	4043 (7.7)	2412 (11.9)	7188 (5.4)	21878 (8.7)		
Non-Hispanic other race	2483 (4.7)	1281 (6.3)	4149 (3.1)	11599 (4.6)		
Non-Hispanic multiracial	1524 (2.4)	620 (3.0)	2351 (1.8)	4062 (1.6)		
Hispanic	2689 (5.1)	1839 (9.0)	6682 (5.0)	22489 (8.9)		

Continued

TABLE 2-Continued

Education*					17814.59	<0.01
Not graduated high school	7575 (14.4)	2457 (12.1)	10707 (8.1)	16931 (6.7)		
Graduated from high school	20978 (40.0)	6920 (34.0)	39499 (29.8)	64651 (25.6)		
Attended college or Technical school	15899 (30.3)	6497 (31.9)	38351 (28.9)	65324 (25.8)		
Graduated from college or Technical school	7947 (15.1)	4441 (21.8)	43840 (33.0)	105173 (41.6)		
Income*					14024.23	<0.01
<$15,000	9736 (18.6)	3929 (19.3)	12053 (9.1)	22242 (8.8)		
$15,000-$24,999	11819 (22.5)	4233 (20.8)	20461 (15.4)	34952 (13.8)		
$25,000-$34,999	6201 (11.8)	2134 (10.5)	14156 (10.7)	23449 (9.3)		
$35,000-$49,999	6846 (13.1)	2463 (12.1)	18340 (13.8)	30766 (12.2)		
≥$50,000	12139 (23.1)	5288 (26.0)	51165 (38.6)	105157 (41.6)		
Alcohol consumption					9044.74	<0.01
Non-drinker	25220 (48.1)	8747 (43.0)	60228 (45.4)	136092 (53.8)		
Light drinker	17201 (32.8)	7955 (39.1)	51040 (38.5)	95304 (37.7)		
Heavy drinker	10036 (19.1)	3639 (17.9)	21409 (16.1)	21331 (8.7)		
Psychological distress					10738.69	<0.01
Good mental health	37670 (71.8)	15034 (73.9)	113922 (85.9)	222103 (87.9)		
Poor mental health	14787 (28.2)	5307 (26.1)	18755 (14.1)	30624 (12.1)		

Note: * - Variables missing data due to refusal and “don’t know” responses

TABLE 3-Crude and Adjusted Odds Ratios for Smoking status, by alcohol consumption: BRFSS, 2013

	Everyday smoker, No.(%)	Non-smoker, No.(%)	Crude OR	95%CI	Adjusted OR	95%CI
Non-drinker	25221 (48.1)	136092 (53.8)	1.00		1.00	
Light drinker	17201 (32.8)	95304 (37.7)	0.97**	0.95-1.00	1.26**	1.23-1.29
Heavy drinker	10036 (19.1)	21331 (8.4)	2.54**	2.47-2.61	3.03**	2.94-3.12
	Someday smoker, No.(%)	Non-smoker, No.(%)				
Non-drinker	8747 (43.0)	136092 (53.8)	1.00		1.00	
Light drinker	7955 (39.1)	95304 (37.7)	1.30**	1.26-1.34	1.59**	1.54-1.65
Heavy drinker	3639 (17.9)	21331 (8.4)	2.65**	2.55-2.77	3.10**	2.96-3.24
	Former smoker, No.(%)	Non-smoker, No.(%)				
Non-drinker	60228 (88.2)	136092 (53.8)	1.00		1.00	
Light drinker	51040 (38.5)	95304 (37.7)	1.21**	1.20-1.23	1.49**	1.47-1.51
Heavy drinker	21409 (16.1)	21331 (8.4)	2.27**	2.22-2.32	2.44**	2.38-2.50
	Everyday smoker, No.(%)	Someday smoker, No.(%)				
Non-drinker	25221 (48.1)	8747 (43.0)	1.00		1.00	
Light drinker	17201 (32.8)	7955 (39.1)	0.75**	0.72-0.78	0.81**	0.78-0.85
Heavy drinker	10036 (19.1)	3639 (17.9)	0.96	0.91-1.00	1.03	0.98-1.08

Note. CI=confidence interval; OR=odds ratio. All analyses were adjusted for age, gender, race, income and education.**p<0.01

TABLE 4-Alcohol Consumption and Smoking Status, by Psychological Distress: BRFSS, 2013

Psychological distress	Alcohol consumption	Everyday smoker, No.(%)	Someday smoker, No.(%)	Former smoker, No.(%)	Non-smoker, No.(%)	X^2 statistic	P value
Good mental health	Non-drinker	17454 (46.3)	6069 (40.4)	49838 (43.7)	118313 (53.3)	8555.26	<0.01
	Light drinker	12813 (34.0)	6141 (40.8)	45070 (39.6)	84978 (38.3)		
	Heavy drinker	7403 (19.7)	2824 (18.8)	19014 (16.7)	18812 (8.5)		
Poor mental health	Non-drinker	7766 (52.5)	2678 (50.5)	10390 (55.4)	17779 (58.1)	976.73	<0.01
	Light drinker	4388 (29.7)	1814 (34.2)	5970 (31.8)	10326 (33.7)		
	Heavy drinker	2633 (17.8)	815 (15.4)	2395 (12.8)	2519 (8.2)		